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Research Article

Posttraumatic stress disorders and extent of psychosocial impairments five years after a traffic accident

Auftreten posttraumatischer Belastungsstörungen und Ausmaß psychosozialer Beeinträchtigungen fünf Jahre nach einem Verkehrsunfall

Jürgen Barth[1]
Stephanie Kopfmann[1,2]
Elisabeth Nyberg[3]
Jörg Angenendt[2]
Ulrich Frommberger[4]

1 Albert-Ludwig University of Freiburg, Institute of Psychology, Department of Rehabilitation Psychology, Freiburg, Germany

2 Freiburg University Hospital, Department of Psychiatry and Psychotherapy, Freiburg, Germany

3 Basle Canton Hospital, Psychiatric Clinic, Basle, Switzerland

4 Klinik an der Lindenhöhe, Clinic for Psychiatry, Psychotherapy, and Psychosomatics, Offenburg, Germany

Abstract

This five year long-term follow-up study estimated the prevalence of Posttraumatic Stress Disorder (PTSD) and other mental health problems in traffic accident victims. 70 patients were invited for a personal interview to assess mental disorders (DIA-X), depression (BDI), mental distress (SCL-90-R), and psychosocial (SDS) and physical impairments at least five years after their first admission to a university hospital (Department of Traumatology). Prevalence of PTSD was 10%, and another 14.2% of the patients also had a partial PTSD. Other mental disorders had a lower prevalence (7.2%). Patients with PTSD did not differ in sociodemographic characteristics from patients without PTSD. PTSD patients were more depressed and showed more general psychological distress. Furthermore, PTSD was associated with impairments in job, social interaction, and leisure activities. Persistent medical and mental problems correlated highly with PTSD. Implications for secondary prevention of persistent mental health problems of traffic accident patients are discussed in their connection with PTSD.

Keywords: Posttraumatic Stress Disorder, partial Posttraumatic Stress Disorder, traffic accident, epidemiology, comorbidity, psychosocial impairment, physical impairment

Zusammenfassung

Die vorliegende Langzeitkatamnese untersuchte das Auftreten der Posttraumatischen Belastungsstörung (PTBS) und anderer psychischer Störungen nach einem Verkehrsunfall. Dazu wurden 70 verletzte Personen, die mindestens fünf Jahre zuvor im Straßenverkehr verunglückten und damals in der unfallchirurgischen Abteilung des Universitätsklinikums Freiburg behandelt worden waren, mit einem standardisierten klinischen Interview (DIA-X) befragt. Zusätzlich wurden depressive Symptome (BDI), allgemeine psychische Beschwerden (SCL-90-R) und anhaltende psychosoziale (SDS) und somatische Beeinträchtigungen erhoben. Die Prävalenz der PTBS fünf Jahre nach dem Verkehrsunfall liegt bei 10%, weitere 14,2% berichten von einer subsyndromalen PTBS. Andere psychische Störungen liegen bei 7,2% der untersuchten Personen vor. Das Auftreten einer PTBS ist unabhängig von soziodemographischen Variablen. Patienten mit einer PTBS berichten über stärkere depressive Symptome und eine allgemein schlechtere psychische Anpassung. Eine PTBS ist mit erheblichen Einschränkungen im beruflichen, gesellschaftlichen und familiären Bereich verbunden. Enge Assoziationen ergeben sich auch mit anhaltenden medizinischen Problemen. Diskutiert werden Maßnahmen für eine sekundäre Prävention psychischer Langzeitfolgen nach Verkehrsunfällen.

Schlüsselwörter: posttraumatische Belastungsstörung, subsyndromale PTBS, Verkehrsunfall, Epidemiologie, Komorbidität, psychosoziale Beeinträchtigung, körperliche Beeinträchtigung

Introduction

Approximately 2 million traffic accidents occur yearly in Germany [1]. 476,000 people are injured, leading to treatment and follow-up treatment costs of 20 billion euros. 6800 patients die of the sequelae of these accidents [2]. Traffic accidents are thus a common trauma which can lead in the immediate aftermath to a posttraumatic stress disorder (PTSD) with partial or full intensity [3], [4]. Between 11.2% [5] and 28.3% [6], [7] of accident patients have a partial PTSD 6 months after the initial event. The frequency of a complete picture of PTSD has been investigated in 11 studies with clinical diagnostics by way of interviews and a catemnesis of at least 12 months [5], [8], [9], [10], [11], [12], [13], [14], [15]. The prevalence rates after 12 months range from 1.9% [14] to 32% [11] depending on the research methodology used and thus show a remarkable degree of variation. These differences are essentially a consequence of the type of sample survey recruiting used (newspaper, all accident victims, police, etc.). The studies with clinical diagnostics also show that approximately one-third of the injured persons suffer from an acute stress disorder (ASD) immediately following the traffic accident and that the further course is characterized by a high rate of spontaneous remission within the first year after the accident [5], [14], [15]. The prognosis of an acute stress disorder for a subsequent PTSD ranges from 30% to 80% [16]. The heterogeneity of these findings regarding prevalence as well as the course of symptoms after 12 months make it evident that there is a considerable need for more research on the long-term effects of traffic accidents.

Epidemiological long-term studies on victims of traffic accidents are often based on self reports via questionnaire (e.g., with the Posttraumatic Symptom Scale; PSS, [17]) since this saves the time and effort of conducting a clinical diagnosis on as many participants of the sample survey as possible. The only existing study investigating the long-term course over a period of five years is that by Mayou et al. (1997) on a group of English patients. This research group estimated the point prevalence of 111 injured accident victims at 8% (PSS) [18]. In a more comprehensive study on 546 patients of an accident clinic three years after a traffic accident, the group found a point prevalence of PTSD of 11% [19]. Thus, a substantial proportion of traffic accident victims suffers from a chronic PTSD which can persist for years after the initial event. The question as to whether traffic accidents are also linked to a frequent occurrence of other mental disorders was not investigated as systematically in the questionnaire studies named above. Studies in which clinical interviews were conducted with traffic accident victims indicated a frequent occurrence of depressive disorders, anxiety disorders, and organic mental disorders [11], [12], [20].

Traffic accident victims also experience other psychosocial impairments which manifest themselves in forms other than a PTSD. In a Norwegian questionnaire study on the physical, psychological, and social sequelae of 551 injured accident victims, 32% reported that they still suffered from physical limitations three years after the accident, often resulting in a reduction in quality of life. 19% of the participants in this survey felt impaired in their psychological health and 18% reported a reduction in their ability to work [21]. Other frequent long-term sequelae of traffic accidents include chronic pain and physical impairments, legal disputes, impaired social relations, and problems at the workplace [18], [19]. This raises the question as to the factors involved in chronicity or remission of PTSD. A few studies on accident patients indicate that continuing medical and financial problems are stronger predictors of a persisting PTSD than the severity of the injury, personality characteristics, or earlier mental disorders [18], [19], [22]. Ongoing legal proceedings are seen as a further risk factor for chronicity. Ehlers and Steil (1995) also assume cognitive patterns, such as a negative interpretation of intrusions, rumination, thought control, and anger [18], [19], [23]. Symptoms of emotional numbing are also said to be associated with chronicity [24].

To summarize, studies with self-evaluation instruments provide clear evidence for the presence of a clinically relevant PTSD in the long term aftermath of a traffic accident. Due to the limited validity of self-evaluation instruments, the goal of this study was to make diagnoses using standardized interviews and to compare these findings with the prevalence estimates of the studies named above. A further goal was to describe psychosocial impairments accompanied by posttraumatic symptoms in patients who had been in a traffic accident. The present study also describes the psychological and psychosocial long-term sequelae (5 years) of a severe traffic accident and provides information on:

1. the prevalence of PTSD, partial PTSD, and other mental disorders five years after a traffic accident and
2. long-term psychological and psychosocial stress and its significance for the manifestation of a complete or partial PTSD.

Methodology

Design

In 2001, we conducted a personal and written study of patients undergoing in-patient treatment at the Department of Accident Surgery of the University Hospital in Freiburg who had been injured in traffic accidents in the years 1995/96 [6], [7], [25], [26] (see Figure 1). The average duration of catamnesis was 6 years and 2 months (SD = 0.69 years). The participants in the study had suffered at least one fracture and had to undergo hospital treatment. Participants were required to be at least 18 years of age and had to reside within 50 km of Freiburg in order to ensure that they were accessible for

the catamnesis. Patients who had been unconscious for more than 15 min. after their accident or had suffered a craniocerebral trauma (validated by CT scan) were excluded from the study (first phase of the study in Figure 1). In the second phase of the study, the extent of posttraumatic stress disorder symptoms was determined after six months. The present partial study included all patients who had been victims of accidents at least 5 years previously (see the third study phase in Figure 1).

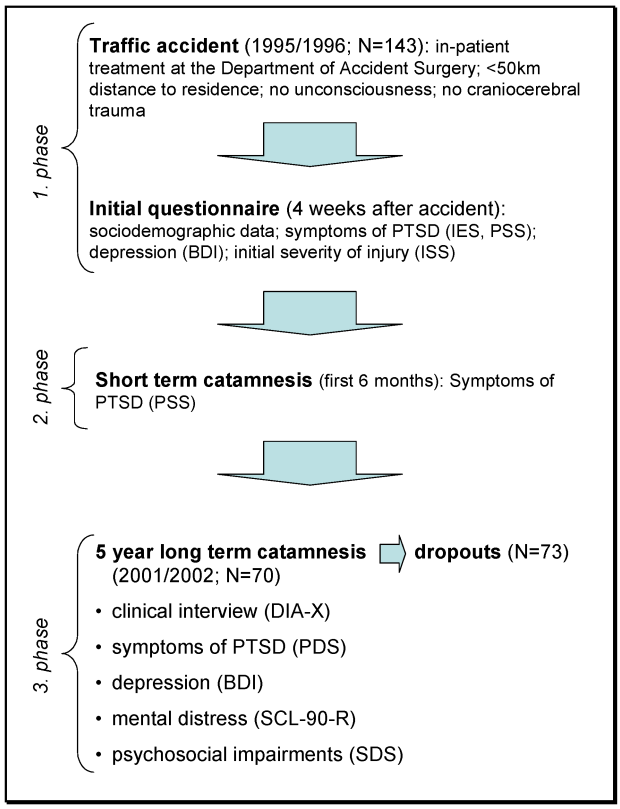

Figure 1: Course of the study

In November 2001, 143 patients were informed in writing of the planned follow-up study and asked if they would be willing to participate in a personal interview. 70 of the 143 accident patients agreed to participate in a survey on possible sequelae of an accident. 48 of these patients (69%) were interviewed at the Department of Traumatology of the Freiburg University Hospital. 6 of the patients (9%) requested to be interviewed at their homes, and 16 (23%) were interviewed by telephone due to the fact that they were no longer in the area. The questionnaires were distributed to the patients after the interview, or sent to them in the case of the participants interviewed by telephone. The study was conducted by a trained interviewer. To ensure the quality of the study, a supervisor visited once a week for the duration of the survey in order to handle potential problems in implementation and codification.

Measuring instruments

Clinical interview and psychosocial distress

We diagnosed PTSD and other mental disorders using the standardized Diagnostic Expert System for ICD-10 and DSM-IV (DIA-X; [27]). The high standardization of this system allows mental disorders to be diagnosed reliably in epidemiological studies. The test-retest reliability and the validity of the system are judged to be sufficiently high [27]. The present study tested for the following mental disorders in accordance with DSM-IV: PTSD, depression, anxiety disorders, alcohol dependency, substance use, and somatization disorder. The presence of a partial PTSD was coded in addition to a diagnosis of the complete picture of PTSD. The diagnosis of partial PTSD was made according the definition of Blanchard et al. (1995) [28], which requires for either the symptom clusters intrusion (cluster B) and avoidance (C) or the symptom clusters intrusion and hyperarousal (D) to be present concurrently. The study also included a time criterion, requiring symptoms to continue for over one month. The criterion of an existing impairment (F) was recorded but was not used as a precondition for making a diagnosis.

The physical, psychological, and social sequelae of the accident were recorded with the structured accident interview of the psychotraumatology research group (Freiburg University Hospital). The participants were requested to rate the severity of their physical impairment and pain at the time of the follow-up study on a scale of "0 = not at all" to "3 = very severe". Financial losses and legal disputes were included in the survey as well as the type of accident. Cognitions concerning the accident, such as rumination or anger with the person who caused the accident, covered further possible sustaining risk factors of a chronic PTSD and were thus also included in the interview. The answer categories "2 = severe" and "3 = very severe" were combined for the analysis.

Injury severity

The initial severity of the injury was determined using the "Injury Severity Score" (ISS; [29]). The ISS values were recorded by medical students under the guidance of accident surgeons of the Freiburg University Hospital.

Self-evaluation questionnaire

The following questionnaire procedures were implemented to assess psychological and psychosocial impairments:

- **PTSD symptoms:** Intrusions and avoidance and psychophysiological symptoms of PTSD were diagnosed with the Posttraumatic Diagnosis Scale (PDS) in accordance with DSM-IV [30], [31]) (17 items, range: 0 to 51 points). The "Impact of Event Scale" (IES) [32] and the Post Traumatic Stress Disorder Symptom Scale (PSS) [17], [33] were implemented as part of the initial study

approximately one week after the accident (up to four weeks).

- **Depression:** Depressive symptoms were diagnosed with the Beck Depression Inventory (BDI) [34], [35] (21 items, range: 0 to 63 points).
- **Psychological symptoms and distress:** Psychological symptoms and distress were recorded with the SCL-90-R Symptom Checklist [36], [37]. Two global reference values provide information on general psychological distress ("global severity index", GSI) (range: 0 to 4 points) and on the amount of existing symptoms ("positive symptom total", PST) (range: 0 to 90 points).
- **Psychosocial impairments:** Impairments in the domains work, free time, and family were assessed with the "Sheehan Disability Scale" (SDS) [38]. Impairments resulting from physical and psychological symptoms were recorded on two subscales with 3 items each (range 0 to 27 points).

Statistical analyses

The data were analyzed with the help of the "Statistical Package for the Social Sciences" (SPSS) for Windows, Version 11.0. Questions as to the prevalence of psychological disorders were processed with the help of descriptive statistical methods. Inferential statistical methods (chi-square tests in accordance with Pearson and analyses of variance) were implemented to analyze the group differences between people with vs. without (partial) PTSD.

Results

Dropout analysis

For various reasons, 73 of the 143 accident victims originally included in the study did not take part in the follow-up study: 6 people refused to participate (8%), 63 moved without leaving an address or were unreachable (86%), and 4 people were deceased (5%). Considering the fact that the period of measurement lasted over five years, the dropout rate of 51% corresponded to our expectations and to the dropout rates of other studies (e.g., Mayou and colleagues 2002 reported a 59% dropout rate after three years [19]).

The dropouts and the participants in the follow-up study differed with regard to **sociodemographic variables**. The people who did not participate were younger at the time of the accident (M=34.1 vs. M=38.4 years; F=3.83, df=140, p=.052) and more often single (60% vs. 41.4%; χ^2=13.08, df=6, p=.042). Students were also more strongly represented among the dropouts than among the participants (21.3% vs. 2.0%; χ^2=27.39, df=11, p=.004). The level of education was also significantly higher among the dropouts (χ^2=9.08, df=4, p=.059). There were no differences as far as gender is concerned (χ^2=1.38, df=1, p=.239). The dropouts and the participants did not differ in the original severity of their injuries (F=0.007, df = 140, p=.934). More of the dropouts than the participants had suffered automobile (16% vs. 10%) or bicycle (22% vs. 18%) accidents. On the other hand, more of the participants had suffered their accidents on motorcycles (15% vs. 10%) or as pedestrians (6% vs. 4%). A chi-square test revealed no significant bias (χ^2=5.11, df=3, p=.164).

Furthermore, we determined whether the interviewed patients differed from the dropouts with regard to their **clinical symptoms**. In the first study phase, the dropouts did not suffer from more posttraumatic stress symptoms than the participants of the interview study (PSS=18.20 vs. 16.70; F = 0.28, p=.60; IES=9.28 vs. 11.98; F=1.99, p=.16). Depressive symptoms (BDI) were also present to a comparable extent in the two groups (BDI=5.66 vs. 6.02; F=0.94, p=.76). The symptoms present after six months were also tested for bias effects. The dropouts did not differ significantly from the remaining participants as far as posttraumatic symptoms are concerned (PSS=5.12 vs. 7.55; F=1.97, p=.17).

Description of the interviewed sample

The average age of the 70 accident patients who participated in the follow-up study was 44.5 years at the time of the study (SD=12.7; range= 24-67). More men (59%) than women (41%) participated in the survey (see Table 1). Approximately half of the participants were married (48.6%). 37.1% of the participants were single; 4.3% were separated from their spouse and 8.5% were divorced or widowed. Most of the people in the study had completed "Realschule" (middle secondary school) (41.4%). 32.9% had earned the "Abitur" (university entrance qualification) and 24.3% had completed the "Hauptschule" (lower secondary school). 68.6% of the participants were employed at the time of the accident. Most of the employed participants were skilled workers or craftsmen (28.6%). 25.7% were white-collar workers or civil servants and 11.4% were self-employed. There was one untrained worker and one student. The 70 participants of the survey had suffered various types of traffic accidents, the most common types being bicycle (32.9%) and motorcycle (30%) accidents. The proportion of automobile accidents was 24.3% and that of pedestrian accidents 12.9%.

Prevalence of PTSD and other mental disorders

The rate of posttraumatic stress disorder among the participants of the sample survey is 24%. Five years after the accident, 10% (n=7) of the accident patients suffer from a complete picture of PTSD and 14.2% (n=10) from a partial PTSD. Seven of the patients with a partial PTSD suffer from intrusions and increased psychophysiological arousal. One person shows marked intrusions and avoidance symptoms. Two patients with a partial PTSD show all symptoms of PTSD, but these symptoms do not cause impairments in work, social activities, or other important functional domains (criterion F). This is true for

Table 1: Characteristics of the total sample and of all patients with a (partial) PTSD

	(partial) PTSD (n = 17)	without (partial) PTSD (n = 53)	total sample (n = 70)	
Age in years (M, SD)	47.1 (14.7)	43.7 (12.1)	44.5 (12.7)	T = 0.96, df (67), p>.30
Gender (%) (m / w)	52.9 / 47.1	60.4 / 39.6	58.6 / 41.4	Chi² = 0.29, df (1), p>.55
Marital status (%)				Chi² = 1.898, df (4), p>.90
married	52.9	47.2	48.6	
separated / divorced	11.8	11.4	11.5	
widowed	-	1.9	1.4	
single	35.3	37.7	37.1	
Education (%)				Chi² = 6.161, df (4), p>.15
no secondary school diploma	5.9	-	1.4	
"Hauptschule"*	35.3	20.7	24.3	
"Realschule"**	41.2	41.5	41.4	
"Abitur"***	17.6	37.7	32.9	
Employed (%) (yes / no)	70.6 / 29.4	67.9 / 32.1	68.6 / 31.4	Chi² = 0.04, df (1), p>.80
Profession (%)				Chi² = 12.76, df (7), p>.15
unemployed	35.3	30.2	31.4	
student	-	1.9	1.4	
trained/untrained worker	-	1.9	1.4	
skilled worker/ craftsman	17.6	32.1	28.6	
white-collar/ civil servant	41.2	20.7	25.7	
self-employed craftsman,	5.8	7.5	7.1	
self-employed with university education	-	5.7	4.3	
Type of accident (%)				Chi² = 1.24, df (3), p>.75
automobile	29.4	22.6	24.3	
motorcycle	29.4	30.2	30.0	
bicycle	23.5	35.8	32.9	
pedestrian	17.6	11.3	12.9	

Legend: (partial) PTSD = Presence of a partial posttraumatic stress disorder or of a complete posttraumatic stress disorder; *"Hauptschule" = lower secondary school; **"Realschule" = middle secondary school; "Abitur" = university entrance qualification

a majority of the 10 patients with partial disorders, only three of whom are impaired by their symptoms in everyday domains. The patients did not report any further traumas during the period of catamnesis.

Over half of the patients with a PTSD (n=4) show signs of an additional axis I disorder. The comorbid disorders diagnosed most frequently are affective disorders (n=3) as well as substance abuse and addiction (n=1). The co-morbidity rate of a partial PTSD is also 50%. Five people with a partial PTSD suffer from a comorbid disorder (more than one diagnosis possible), such as a dysthymia (n=3), specific phobias (n=3), or a pain disorder (n=2). As far as other mental disorders in patients without a partial or complete PTSD are concerned, four people showed signs of affective disorders (major depression, dysthymic disorder) and two of a pain disorder.

Severity of posttraumatic stress symptoms

As expected, patients with a PTSD show more severe impairments from posttraumatic stress symptoms than do those with a partial PTSD or those without a PTSD (see Table 2). This severity is also evident at the level of the PTSD clusters (intrusion, avoidance, hyperarousal). However, patients with a partial PTSD are also more severely impaired on the whole than are healthy people. Only as far as the occurrence of intrusions is concerned are patients with a partial PTSD comparable with healthy people. Avoidance symptoms are the most marked of all symptom criteria, in patients with a PTSD as well as in those with a partial PTSD.

In order to simplify the presentation of the results, we will combine the patients with a PTSD with those with a partial PTSD in the following and refer to the diagnosis of both groups as (partial) PTSD.

Table 2: Posttraumatic symptoms for each diagnostic group (means, standard deviation)

PDS	PTSD (n = 7)	(partial) PTSD (n = 10)	without (partial) PTSD (n = 49)	F value (df = 2.62)
sum M (SD)	19.14 (13.46)	6.50 (7.75)	0.67 (1.40)	40.14***
intrusion M (SD)	6.14 (4.26)	0.90 (1.60)	0.14 (0.54)	47.65***
avoidance M (SD)	7.86 (6.04)	3.30 (4.00)	0.33 (0.90)	29.98***
arousal M (SD)	5.14 (4.41)	2.30 (3.13)	0.20 (0.58)	23.94***

Legend: analysis of variance, $p \leq .05$, **$p \leq .01$, ***$p \leq .001$, PDS = German translation of the Posttraumatic Stress Diagnostic Scale (PDS) [31]; PTSD = posttraumatic stress disorder; (partial) PTSD = partial posttraumatic stress disorder; without (partial) PTSD = patients without a partial PTSD and without a complete PTSD

Associated characteristics of (partial) PTSD

None of the sociodemographic variables - age, gender, marital status, education, and profession - is associated with the diagnosis of a (partial) PTSD (see Table 1). In the following we will refer to the analysis of the self-evaluation scales, which reflect the perceived extent of psychological and psychosocial impairments of the accident patients at the time of the catamnesis (see Table 3).

Patients with a (partial) PTSD are clearly more depressive than those without a posttraumatic stress disorder ($F=31.55$, $df=64$, $p<.001$). Patients with a (partial) PTSD suffer from more symptoms in the SCL-90-R (PST) and have a higher level of general psychological distress (GSI) than people without a (partial) PTSD (PST: $F=17.14$, $df=54$, $p<.001$, GSI: $F=14.85$, $df=54$, $p<.001$). For all patients included in the study, impairments resulting from physical illness are more severe than those resulting from psychological problems ($M=7.09$ (8.85) vs. $M=3.68$ (6.82)). For patients with a (partial) PTSD, physical or psychological impairments are associated with major limitations in professional, societal, and family life (see Table 3). PTSD patients show a considerably worse level of functioning in *all* domains than do people without a (partial) PTSD. At the same time, it should be pointed out that PTSD patients are also more likely to perceive their physical impairments as limitations.

The analyses of functional limitations in daily life produced the following results (without table): Patients with a (partial) PTSD think about their accident more often than those without a posttraumatic stress disorder (35.3% vs. 1.9%; $\chi^2=19.37$, $df=3$, $p<.001$). When reminded of their accident, patients with a (partial) PTSD are more likely to react with fury and anger than those who do not suffer from a (partial) PTSD (52.9% vs. 1.9%; $\chi^2=28.26$, $df=3$, $p<.001$). They also are more likely to reproach themselves or others, such as the person who caused the accident, for the accident and its consequences ("self-reproach": 23.6% vs. 0%; $\chi^2=16.52$, $df=3$, $p=.001$, "reproach of other": 29.4% vs. 3.8%; $\chi^2=20.69$, $df=3$, $p<.001$).

People injured in accidents who have a (partial) PTSD are more often still in legal disputes five years after their accident than people without a (partial) PTSD (23.5% vs. 0%; $\chi^2=16.22$, $df=2$, $p<.001$). A closer inspection of these data shows that only the accident victims with a (partial) PTSD are still in legal disputes. Major financial losses are also more frequent in patients with a (partial) PTSD than in those without a (partial) PTSD (41.1% vs. 5.7%; $\chi^2=21.62$, $df=3$, $p<.001$).

More than three-fourths of the patients with a (partial) PTSD have suffered from physical impairments since the accident. These patients thus clearly suffer from more severe physical pain resulting from their accident than do those without a (partial) PTSD. (82.3% vs. 11.3%; $\chi^2=32.95$, $df=3$, $p<.001$). The former group also suffers more frequently from severe continuous pain (70.6% vs. 13.2%; $\chi^2=21.51$, $df=3$, $p<.001$). As a result, they also take analgesics or sedatives more frequently (41.2 vs. 1.9%; $\chi^2=19.77$, $df=3$, $p<.001$).

Initial symptoms and course of the illness

We did not find any relation between the manifestation of a (partial) PTSD and the type of accident (automobile, motorcycle, bicycle, pedestrian; see Table 1). We also tested whether **clinical characteristics** influence the development of a (partial) PTSD (see Table 4). People with a (partial) PTSD do not differ from people who are currently physically healthy in the severity of their injuries (ISS) or in initial PTSD symptoms (IES, PSS). There are

Table 3: Depression, psychological distress, and functional limitations for each diagnostic group

		(partial) PTSD (n = 17)	without (partial) PTSD (n = 49)	F value; df, P value
BDI M (SD)		14.82 (11.82)	3.61 (4.52)	31.55; 64, p <.001
SCL-90-R M (SD)	*GSI*	0.82 (0.91)	0.23 (0.23)	14.85; 54, p <.001
	PST	36.80 (23.85)	15.88 (13.40)	17.14; 54, p <.001
SDS [1]				
Physical impairments M (SD)	***sum***	15.12 (9.10)	4.25 (6.84)	26.50; 63, p <.001
	work	4.88 (3.53)	1.50 (2.36)	19.60; 63, p <.001
	free time	5.47 (3.12)	1.40 (2.31)	32.21; 63, p <.001
	family	4.76 (1.35)	1.35 (3.34)	12.47; 63, p <.01
Psychological impairments M (SD)	***sum***	9.88 (9.65)	1.48 (3.58)	26.70; 63, p <.001
	work	3.47 (3.57)	0.35 (0.93)	31.32; 63, p <.001
	free time	3.41 (3.32)	0.65 (1.38)	22.82; 63, p <.001
	family	3.00 (3.20)	0.48 (1.47)	18.90; 63, p <.001

Legend: PTSD: posttraumatic stress disorder; (partial) PTSD: partial posttraumatic stress disorder, BDI: Beck Depression Inventory; SCL-90-R: Symptom Checklist; GSI: Global Severity Index; PST: Positive Symptoms Total; SDS: Sheehan Disability Scale; [1]without (partial) PTSD: n = 48.

Table 4: Comparison of the clinical symptoms of patients with (partial) PTSD and those of patients without PTSD (means, standard deviations)

	(partial) PTSD (n = 17)	without (partial) PTSD (n = 53)	F value; P value
Injury severity ISS (17, 53) †	13.06 (9.77)	9.83 (6.71)	F = 2.36; p =.13
Initial PTSD symptoms			
PSS (11, 36)	22.36 (14.58)	14.97 (14.29)	F = 2.24; p =.14
IES (11, 36)	14.18 (11.29)	11.31 (9.01)	F = 0.75; p =.39
Initial depression			
BDI (11, 33)	10.00 (9.01)	4.70 (3.63)	F = 7.80; p <.01
PTSD symptoms after six months			
PSS (7, 35)	20.00 (15.33)	5.06 (4.05)	F = 26.48; p <.01

† The numbers in parentheses refer to the size of the sample at each time of measurement.
Legend: PTSD: posttraumatic stress disorder; ISS: Injury Severity Score; PSS: Post Traumatic Stress Disorder Symptom Scale; IES: Impact of Event Scale; BDI: Beck Depression Inventory

significant differences in the depressed mood of the patients in the initial study, where the patients who were later diagnosed with a (partial) PTSD were already more depressed than those who remained mentally healthy (F=7.80; p<.01). Six months after the accident, patients who were later diagnosed with a (partial) PTSD attained values which were four times higher than those of psychologically healthy accident victims (F=26,48; p<.01). Findings on clinical parameters must be interpreted with caution due to the selective returns of the questionnaire: Data for earlier points of measurement are available for only approximately 70% of the people currently participating in the study.

Conclusion and discussion

This study uses a combination of interview and self-evaluation methods to attain a complex description of the long-term psychological and psychosocial sequelae of traffic accidents. Five years after the accident, 10% of the accident victims included in the study suffer from a posttraumatic stress disorder. The prevalence of a partial PTSD among the patients included in the study is 14.2%. These prevalence rates correspond to findings from long-term studies (>3 years) conducted with self-evaluation instruments (8% [18]; 11% [19]). The longest existing prospective study which diagnosed the presence of a partial PTSD in accordance with the definition of Blanchard et al. (1995) [28] reported a 12 month prevalence of 12.3% [14]. Thus, the standardized clinical diagnosis used in the present study confirms the prevalence of posttraumatic stress syndromes estimated previously on the basis of self-evaluation methods.

On the whole, more people suffer from a partial PTSD than from the complete picture of the illness. This high prevalence is qualified by the finding that only one-third of the people with subsyndromal symptoms suffer from impairments in daily life. Parallel to our findings, a recent study by Mylle and Maes (2004) found a partial PTSD in 60.7% of 185 burn victims (CIDI) [39]. However, these authors required only the presence of one of the three symptom criteria B, C, or D for a diagnosis. When the impairment criterion (criterion F) was included in making the diagnoses, the prevalence was reduced to 16.7%. This example demonstrates that there is an urgent need to clarify the combination of symptoms necessary for diagnosis of a partial PTSD. The classification according to the criteria of Blanchard et al. used in the present study [28] could be extended to include criterion F, which would reduce the prevalence of a partial PTSD in the present study to 4.3%.

In presenting our results, we combined people with a PTSD and people with only a partial diagnosis in order to reduce statistical tests (alpha error inflation). This is clinically acceptable because people with a partial diagnosis of PTSD symptoms are more similar to people with the complete picture of the disorder than to mentally healthy people. The majority of accident victims with a partial PTSD describe symptoms of intrusions and hyperarousal in the *clinical interviews*. The presence of intrusions and avoidance symptoms together is a rather infrequent combination of criteria in the present study, and this conforms to other findings [40], [41]. However, at the same time it should be pointed out that people with a partial PTSD report only a low extent of intrusions in the *questionnaires*. The dominant symptoms in the questionnaires are marked avoidance behavior and hyperarousal. It might be possible to explain these divergent findings by operationalizing intrusions in the DIA-X ("Were you troubled by memories [of the event] in the form of thoughts and "images" that ran through your head repeatedly (even if you did not want to be reminded of it)?), where memories are not formulated explicitly as "flashbacks" or "intrusive recollections" - as required by ICD 10 or DSM IV.

Other mental disorders appear more frequently as comorbid disorders of PTSD and are present less often as independent disorders. The high comorbidity rate of PTSD in this study, especially among patients with depressive disorders, confirms the findings of other studies on traffic accident victims [5], [11], [20], [42]. An initially high level of depression has been shown to be a predictor of a PTSD in prospective studies with shorter periods of catamnesis [5], [7], [8], [22], [25]. These findings proved in this study to be a long-term predictor for the chronicity of the (partial) PTSD. In addition, findings from meta-analyses indicate that a poor premorbid psychological state correlates with the development of a PTSD at .20 [43], [44]. It is not possible to identify the direction of the influence of PTSD and affective disorders on the basis of the present study due to a lack of meaningful information on the premorbid health status of the patients.

The comorbidity of mental and physical illnesses also received attention in the present study. No patient in the study with the complete picture of a posttraumatic stress disorder had recovered his or her physical health completely five years after the accident. Severe physical impairments and chronic pain are important contributing factors to a PTSD in the long-term aftermath of an accident [5], [7], [8], [18], [19], [22]. It may be assumed that continuing physical problems make great demands on people's ability to get over an accident and thus complicate their ability to overcome the psychological trauma connected with it.

The social support a patient receives after the trauma has proved, along with specific variables of the traumatic situation (peritraumatic dissociation and peritraumatic emotion; r=.43 and r=.28, respectively), to be a significant variable for the development and chronicity of a PTSD after a trauma (r=-.29; [44]). Numerous patients in the present study describe considerable limitations in free time activities and in family life (see Table 3). Although data on social support were not collected directly, the results of the present study suggest that psychosocial limitations provide poor preconditions for coping with the psychological as well as with the physical impairments caused by an accident.

The fact that a PTSD following a traffic accident can take a chronic course and is associated with a reduction in quality of life raises the question as to the form measures of secondary prevention should take. Despite their proximity to the research center and our explicit offer, none of the people included in the study took advantage of psychological support or psychotherapy. On the other hand, several successful psychotherapeutical concepts for early intervention are known [45]. Early interventions require good interdisciplinary work. A study on the psychological care of accident victims in Germany revealed that psychotraumatological acute care and aftercare is still in a state of development and in need of improvements in content and structure, especially when one considers the high prevalence rate of posttraumatic stress disorders in Germany [46]. Since it is neither necessary nor are the facilities available to offer all accident surgery patients an early intervention, a screening should be conducted in acute care in order to identify high-risk patients [47]. More intensive interdisciplinary cooperation between surgical treatment facilities (consulting or liaison services with psychiatric or psychological departments) would be a necessary measure for rehabilitating patients effectively after a traffic accident. New treatment conceptions should also take into account the problem of how to motivate patients to undergo psychotherapeutic treatment.

Limitations of the study

Representativity: The study may be considered a representative sample survey study of severe accident injuries for the Freiburg area, because an estimated 90% of all accident victims requiring stationary care receive treatment at the Department of Accident Surgery of the University Hospital. However, the representativity is limited somewhat by the dropout rate of 51% and the narrow scope of the sample survey.
Diagnoses: We classified mental disorders using the DIA-X, a recognized procedure for epidemiological studies which prescribes clear criteria for making a diagnosis. Nevertheless, the validity of the diagnoses needs to be discussed in more detail (see above).
Interviews: One-fourth of the people who participated in the survey had to be interviewed by telephone due to the fact that they were no longer in the area. This may constitute a limitation in the validity of the statements of these patients. However, since the DIA-X is highly standardized, the clinical impression of the interviewer is not relevant for the diagnosis. This keeps the bias effects comparatively low. We did not find any differences in the epidemiological results.
Definition of the diagnosis: We used an established algorithm to classify partial PTSD. This is a convention of the study, and a modification of this convention could lead to other findings (see above).

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References

1. Statistisches Bundesamt Deutschland. Die Gesundheitsberichterstattung des Bundes im Auftrag des Bundesministeriums für Bildung und Forschung. Wiesbaden: Statistisches Bundesamt Deutschland; 2003.
2. Bundesanstalt für Straßenwesen. Unfalldaten des Bundes im Auftrag des Bundesministeriums für Verkehr, Bau- und Wohnungswesen. Bergisch Gladbach: Bundesanstalt für Straßenwesen; 2003.
3. Norris FH. Epidemiology of trauma. Frequency and impact of different demographic groups. J Consult Clin Psychol. 1992;60:409-18.
4. Frommberger U, Schlickewei W, Stieglitz RD, Nyberg E, Kuner E, Berger M. Die psychischen Folgen nach Verkehrsunfällen: Relevanz, diagnostische Kriterien und Therapie psychischer Störungen. Unfallchirurgie. 1998;3:115-21.
5. Blanchard EB, Hickling EJ, Forneris EA, Taylor AE, Buckley TC, Loos WR, et al. Prediction of remission of acute posttraumatic stress disorder in motor vehicle accident victims. J Trauma Stress. 1997;10:215-34.
6. Frommberger U, Schlickewei W, Nyberg E, Stieglitz RD, Kuner E, Berger M. Die psychischen Folgen nach Verkehrsunfällen: Ergebnisse einer prospektiven Studie. Unfallchirurgie. 1998;3:122-8.
7. Frommberger U, Stieglitz RD, Nyberg E, Schlickewei W, Kuner E, Berger M. Prediction of posttraumatic stress disorder by immediate reactions to trauma: a prospective study in road traffic accident victims. Eur Arch Psychiatry Clin Neurosci. 1998;248:316-21.
8. Blanchard EB, Hickling EJ, Taylor AE, Loos WR, Forneris CA, Jaccard J. Who develops PTSD from motor vehicle accidents? Behav Res Ther. 1996;34:1-10.
9. Harvey AG, Bryant RA. The relationship between acute stress disorder and posttraumatic stress disorder: a prospective evaluation of motor vehicle accident survivors. J Consult Clin Psychol. 1998;66:507-12.
10. Jeavons S. Predicting who suffers psychological trauma in the first year after a road accident. Behav Res Ther. 2000;38(5):499-508.
11. Koren D, Arnon I, Klein E. Acute stress response and posttraumatic stress disorder in traffic accident victims: a one-year prospective, follow-up study. Am J Psychiatry. 1999;156:367-73.
12. Malt UF. The long-term psychiatric consequences of accidental injury: A longitudinal study of 107 adults. Br J Psychiatry. 1988;153:810-8.
13. Mayou R, Bryant B, Duthie R. Psychiatric consequences of road traffic accidents. Br Med J. 1993;307:647-51.

14. Schnyder U, Moergeli HP, Klaghofer R, Buddeberg C. Incidence and prediction of posttraumatic stress disorder symptoms in severely injured accident victims. Am J Psychiatry. 2001;158:594-9.
15. Ursano RJ, Fullerton CS, Epstein RS, Crowley B, Kao T-C, Vance K, et al. Acute and chronic postraumatic stress disorder in motor vehicle accident victims. Am J Psychiatry. 1999;156:589-95.
16. Bryant RA. Early predictors of posttraumatic stress disorder. Biol Psychiatry. 2003;53:789-95.
17. Foa EB, Riggs DS, Dancu CV, Rothbaum BO. Reliability and validity of a brief instrument assessing posttraumatic stress disorder. J Trauma Stress. 1993;4:459-73.
18. Mayou R, Tyndel S, Bryant B. Long-term outcome of motor vehicle accident injury. Psychosom Med. 1997;59:578-84.
19. Mayou R, Ehlers A, Bryant B. Posttraumatic stress disorder after motor vehicle accidents: 3-year follow-up of a prospective longitudinal study. Behav Res Ther. 2002;40:665-75.
20. Blanchard EB, Buckley TC, Hickling EJ, Taylor AE. Posttraumatic stress disorder and comorbid depression: is the correlation an illusion? J Trauma Stress. 1998;12:21-37.
21. Malt UF, Blikra B, Høivik B. The three-year biopsychosocial outcome of 551 hospitalized accidentally injured adults. Acta Psychiatr Scand. 1989;80:84-93.
22. Ehlers A, Mayou RA, Bridget B. Psychological predictors of chronic posttraumatic stress disorder after motor vehicle accidents. J Abnorm Psychol. 1998;107:508-19.
23. Ehlers A, Steil R. Maintenance of intrusive memories in posttraumatic stress disorder: A cognitive approach. Behav Cognit Psychother. 1995;23:217-49.
24. Kuhn E, Blanchard EB, Hickling EJ. Posttraumatic stress disorder and psychosocial functioning within two samples of MVA survivors. Behav Res Ther. 2003;41:1105-12.
25. Frommberger U, Stieglitz R-D, Straub S, Nyberg E, Schlickewei W, Kuner E, et al. The concept of "sense of coherence" and the development of posttraumatic stress disorder in traffic accident victims. J Psychosom Res. 1998;46:343-8.
26. Nyberg E. Posttraumatische Belastungsstörungen und andere psychische Störungen nach schweren Verkehrs- und Arbeitsunfällen. Eine prospektive Studie. [Unveröffentlichte Dissertation]. Freiburg i. Br: Albert-Ludwigs-Universität; 2001.
27. Wittchen HU, Pfister H. DIA-X - Diagnostisches Expertensystem für ICD-10 und DSM-IV. Frankfurt: Swets & Zeitlinger; 1997.
28. Blanchard EB, Hickling EJ, Vollmer AJ, Loos WR, Buckley TC, Jaccard J. Short-term follow up of post-traumatic stress symptoms in motor vehicle accident victims. Behav ResTher. 1995:369-77.
29. Greenspan L, McLellan BA, Greig H. Abbreviated injury scale and injury severity score: a scoring chart. J Trauma. 1985;25:60-4.
30. Foa EB, Riggs DS, Dancu CV, Rothbaum BO. PDS (Posttraumatic Stress Diagnostic Scale). Manual. Minneapolis: National Computer Systems; 1995.
31. Ehlers A, Steil R, Winter H, Foa EB. Deutsche Übersetzung der Posttraumatic Stress Diagnostic Scale (PDS). Oxford: University, Warneford Hospital, Department of Psychiatry; 1996.
32. Horowitz MJ, Wilner N, Alvarez W. Impact of Event Scale: A measure of subjective distress. Psychosom Med. 1979;41:209-18.
33. Winter H, Wenninger R, Ehlers A. Deutsche Übersetzung der PTSD-Symptom-Scale Self-Report: Psychologisches Institut Göttingen. Georg-August-Universität; 1992.
34. Beck AT, Ward CH, Mendelson M, Mock JE, Erbaugh JK. An inventory for measuring depression. Arch Gen Psychiatry. 1967;4:561-71.
35. Hautzinger M, Bailer M, Worall H, Keller F. Das Beck Depressionsinventar - BDI. Bern: Huber; 1992.
36. Derogatis LR. The SCL-90-R: Administration scoring and procedures. Manual II. In. Baltimore: Clinial Psychometric Research; 1983.
37. Franke GH. SCL-90-R. Die Symptom-Checkliste von Derogatis - Deutsche Version. Göttingen: Beltz-Test-Gesellschaft; 1995.
38. Leon CA, Olfson M, Portera L, Farber L, Sheehan DV. Assessing psychiatric impairment in primary care with the Sheehan Disability Scale. J Psychiatry Med. 1997;27(2):93-105.
39. Mylle J, Maes M. Partial posttraumatic stress disorder revisited. J Affect Disord. 2004;78:37-48.
40. Carlier IVE, Gersons BPR. Partial Posttraumatic Stress Disorder (PTSD): The issue of psychological scars and the occurance of PTSD symptoms. J Nerv Ment Dis. 1995;183:107-9.
41. Schützwohl M, Maercker A. Effects of Varying Diagnostic Criteria for Posttraumatic Stress Disorder are endorsing the concept of partial PTSD. J Trauma Stress. 1999;12:155-65.
42. Freedman SA, Brandes D, Peri T, Shalev A. Predictors of chronic post-traumatic stress disorder. A prospective study. Br J Psychiatry. 1999;174:353-9.
43. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. J Consult Clin Psychol. 2000;68:748-66.
44. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. Psychol Bull. 2003;129:52-73.
45. Ehlers A, Clark DM. Early psychological interventions for adult survivors of trauma: a review. Biol Psychiatry. 2003;53:817-26.
46. Flatten G, Erli HJ, Hardörfer V, Jünger S, Paar O, Petzold ER. Zum Stand der psychischen Versorgung von Unfallopfern in Deutschland. Unfallchirurg. 2001;105(2):231-6.
47. Stieglitz RD, Nyberg E, Albert M, Frommberger U, Berger M. Entwicklung eines Screeninginstruments zur Identifizierung von Risikopatienten für die Entwicklung einer Posttraumatischen Belastungsstörung (PTB) nach einem Verkehrsunfall. Z Klin Psychol Psychother. 2002;31(1):22-30.

Corresponding author:

Dr. Jürgen Barth
Albert-Ludwigs-Universität Freiburg, Institut für Psychologie, Abteilung für Rehabilitationspsychologie, 79085 Freiburg, Tel.: ++49 (0)761/203-3053, Fax: ++49 (0)761/203-3040
mail@juergen-barth.de

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